

TABLE 56.50–105—ACCEPTABLE MATERIALS AND TOUGHNESS TEST CRITERIA<sup>2</sup>—Continued

Product form	ASTM specification <sup>3</sup>	Grade <sup>4</sup>	Minimum service temperature	Minimum avg Charpy V notch energy
Bolting .....	A-320 .....	L7, L9, L10, L43 .....	– 150 °F .....	average must be attained in these tests.
		B8D, B8T, B8F, B8M ...	– 325 °F .....	20 ft. lb.
		2B8, B8C .....	No limit .....	No test required.
				No test required, except for service temperatures colder than – 425 °F. In such case the minimum average energy is 25 ft. lb.
Nuts, bolting .....	A-194 .....	4 .....	– 150 °F .....	20 ft. lb.
		8T, 8F .....	– 325 °F .....	No test required.
		8, 8C .....	No limit .....	Same requirement as comparable grades (B8, B8C) of bolting listed above.

<sup>1</sup> Quench and temper heat treatment may be permitted when specifically authorized by the Commandant. In those cases the minimum average Charpy V-notch energy shall be specially designated by the Commandant.

<sup>2</sup> Other material specifications for product forms acceptable under part 54 for use at low temperatures may also be used for piping systems provided the applicable toughness requirements of this Table are also met.

<sup>3</sup> Any repair method must be acceptable to the Commandant CG-ENG, and welding repairs as well as fabrication welding must be in accordance with part 57 of this chapter.

<sup>4</sup> The acceptability of several alloys for low temperature service is not intended to suggest acceptable resistance to marine corrosion. The selection of alloys for any particular shipboard location must take corrosion resistance into account and be approved by the Marine Safety Center.

NOTE: The ASTM standards listed in table 56.50–105 are incorporated by reference; see 46 CFR 56.01–2.

[CGFR 68–82, 33 FR 18843, Dec. 18, 1968, as amended by CGFR 72–59R, 37 FR 6189, 6190, Mar. 25, 1972; CGD 73–254, 40 FR 40165, Sept. 2, 1975; CG 79–108, 43 FR 46545, Oct. 10, 1978; CGD 74–289, 44 FR 26008, May 3, 1979; CGD 77–140, 54 FR 40611, Oct. 2, 1989; CGD 83–043, 60 FR 24775, May 10, 1995; USCG–2000–7790, 65 FR 58460, Sept. 29, 2000; USCG–2003–16630, 73 FR 65178, Oct. 31, 2008; USCG–2009–0702, 74 FR 49228, Sept. 25, 2009; USCG–2012–0832, 77 FR 59777, Oct. 1, 2012]

#### § 56.50–110 Diving support systems.

(a) In addition to the requirements of this part, piping for diving installations which is permanently installed on the vessel must meet the requirements of subpart B (Commercial Diving Operations) of part 197 of this chapter.

(b) Piping for diving installations which is not permanently installed on the vessel need not meet the requirements of this part, but must meet the requirements of subpart B of part 197 of this chapter.

(c) Piping internal to a pressure vessel for human occupancy (PVHO) need not meet the requirements of this part, but must meet the requirements of subpart B of part 197 of this chapter.

[CGD 76–009, 43 FR 53683, Nov. 16, 1978]

#### Subpart 56.60—Materials

##### § 56.60–1 Acceptable materials and specifications (replaces 123 and Table 126.1 in ASME B31.1).

(a)(1) The material requirements in this subpart shall be followed in lieu of those in 123 in ASME B31.1 (incorporated by reference; see 46 CFR 56.01–2).

(2) Materials used in piping systems must be selected from the specifications that appear in Table 56.60–1(a) of this section or 46 CFR 56.60–2, Table 56.60–2(a), or they may be selected from the material specifications of sections I or VIII of the ASME Boiler and Pressure Vessel Code (both incorporated by reference; see 46 CFR 56.01–2) if not prohibited by a regulation of this subchapter dealing with the particular

section of the ASME Boiler and Pressure Vessel Code. Table 56.60-1(a) of this section contains only pipe, tubing, and fitting specifications. Determination of acceptability of plate, forgings, bolting, nuts, and castings may be made by reference to the ASME Boiler and Pressure Vessel Code as previously described. Additionally, accepted materials for use as piping system components appear in 46 CFR 56.60-2, Table 56.60-2(a). Materials conforming to specifications not described in this subparagraph must receive the specific approval of the Marine Safety Center before being used. Materials listed in Table 126.1 of ASME B31.1 are not accepted unless specifically permitted by this paragraph.

(b) Components made in accordance with the commercial standards listed

in Table 56.60-1(b) of this section and made of materials complying with paragraph (a) this section may be used in piping systems within the limitations of the standards and within any further limitations specified in this subchapter.

NOTE: Table 56.60-1(a) replaces Table 126.1 in ASME B31.1 and sets forth specifications of pipes, tubing, and fittings intended for use in piping-systems. The first column lists acceptable standards from ASTM (all incorporated by reference; see 46 CFR 56.01-2); the second lists those from ASME (all incorporated by reference; see 46 CFR 56.01-2). The Coast Guard will consider use of alternative pipes, tubing, and fittings when it receives certification of their mechanical properties. Without this certification it will restrict use of such alternatives to piping-systems inside heat exchangers that ensure containment of the material inside pressure shells.

TABLE 56.60-1(a)—ADOPTED SPECIFICATIONS AND STANDARDS

ASTM standards	ASME standards	Notes
Pipe, seamless:		
A 106 Carbon steel .....	ASME B31.1.	
A 335 Ferritic alloys .....	ASME B31.1.	
A 376 Austenitic alloys .....	ASME B31.1 .....	(1).
Pipe, seamless and welded:		
A 53 Types S, F, and E steel pipe .....	ASME B31.1 .....	(2 3 4).
A 312 Austenitic steel (welded with no filler metal).	ASME B31.1 .....	(1 4).
A 333 Low temperature steel pipe .....	Sec. VIII of the ASME Boiler and Pressure Vessel Code.	(5).
Pipe, welded:		
A 134 Fusion welded steel plate pipe ..	See footnote 7 .....	(7).
A 135 ERW pipe .....	ASME B31.1 .....	(3).
A 139 Grade B only, fusion welded steel pipe.	ASME B31.1 .....	(8).
A 358 Electric fusion welded pipe, high temperature, austenitic.	ASME B31.1 .....	(1 4 9).
Pipe, forged and bored:		
A 369 Ferritic alloy .....	ASME B31.1.	
Pipe, centrifugally cast: .....	(None applicable) .....	(1 9)
Tube, seamless:		
A 179 Carbon steel heat exchanger and condenser tubes.	UCS23, Sec. VIII of the ASME Boiler and Pressure Vessel Code.	(11).
A 192 Carbon steel boiler tubes .....	PG23.1, Sec. I of the ASME Boiler and Pressure Vessel Code.	(10).
A 210 Medium carbon boiler tubes .....	PG23.1, Sec. I of the ASME Boiler and Pressure Vessel Code.	
A 213 Ferritic and austenitic boiler tubes.	PG23.1, Sec. I of the ASME Boiler and Pressure Vessel Code.	(1).
Tube, seamless and welded:		
A 268 Seamless and ERW ferritic stainless tubing.	PG23.1, Sec. I of the ASME Boiler and Pressure Vessel Code.	(4).
A 334 Seamless and welded (no added filler metal) carbon and low alloy tubing for low temperature.	UCS23, Sec. VIII of the ASME Boiler and Pressure Vessel Code.	(4 5).
Tube, welded:		
A 178 (Grades A and C only) ERW boiler tubes.	PG23.1, Sec. I of the ASME Boiler and Pressure Vessel Code.	(10 Grade A) (4).
A 214 ERW heat exchanger and condenser tubes.	UCS27, Sec. VIII of the ASME Boiler and Pressure Vessel Code.	
A 226 ERW boiler and superheater tubes.	PG23.1, Sec. I of the ASME Boiler and Pressure Vessel Code.	(4 10).
A 249 Welded austenitic boiler and heat exchanger tubes (no added filler metal).	PG23.1, Sec. I of the ASME Boiler and Pressure Vessel Code.	(1 4).

TABLE 56.60–1(a)—ADOPTED SPECIFICATIONS AND STANDARDS—Continued

ASTM standards		ASME standards		Notes	
Wrought fittings (factory made):					
A 234 Carbon and ferritic alloys .....		Conforms to applicable American National Standards (ASME B16.9 and ASME B16.11).		(12).	
A 403 Austenitic alloys .....		.....do .....		(12).	
A 420 Low temperature carbon and steel alloy.		.....do .....		(12).	
Castings, <sup>13</sup> iron:					
A 47 Malleable iron .....		Conform to applicable American National Standards or refer to UCI–23 or UCD–23, Sec. VIII of the ASME Boiler and Pressure Vessel Code.		(14).	
A 126 Gray iron .....		.....do .....		(14).	
A 197 Malleable iron .....		.....do .....		(14).	
A 395 Ductile iron .....		UCD–23, Sec. VIII of the ASME Boiler and Pressure Vessel Code.		(14).	
A 536 Ductile iron .....		See footnote 20 .....		(20).	
Nonferrous Materials <sup>15</sup>					
Pipe, seamless:					
B 42 Copper .....		UNF23, Sec. VIII of the ASME Boiler and Pressure Vessel Code.		(16).	
B 43 Red brass .....		.....do.			
B 241 Aluminum alloy .....		.....do.			
Pipe and tube, seamless:					
B 161 Nickel .....		.....do.			
B 165 Nickel-copper .....		.....do.			
B 167 Ni-Cr-Fe .....		.....do.			
B 315 Copper-silicon .....		.....do.			
Tube, seamless:					
B 68 Copper .....		See footnote 17 .....		(16 17 18).	
B 75 Copper .....		UNF23, Sec. VIII of the ASME Boiler and Pressure Vessel Code.		(16).	
B 88 Copper .....		See footnote 17 .....		(16 17).	
B 111 Copper and copper alloy .....		UNF23, Sec. VIII of the ASME Boiler and Pressure Vessel Code.			
B 210 Aluminum alloy, drawn .....		.....do.			
B 234 Aluminum alloy, drawn .....		.....do.			
B 280 Copper tube for refrigeration service.		See footnote 17 .....		(16 17).	
Welding fittings:					
B 361 Wrought aluminum welding fittings.		Shall meet ASME Standards.			
ASTM specification		Minimum tensile	Longitudinal joint efficiency	P No.	Allowable stresses (p.s.i.)
A 134:					
Grade 285A .....		45,000	0.80	1	11,250 × 0.8 = 9,000.
Grade 285B .....		50,000	0.80	1	12,500 × 0.8 = 10,000.
Grade 285C .....		55,000	0.80	1	13,750 × 0.8 = 11,000.

**Note:** When using 104.1.2 in ASME B31.1 to compute wall thickness, the stress shown here shall be applied as though taken from the stress tables. An additional factor of 0.8 may be required by § 56.07–10(c) and (e).

<sup>1</sup>For austenitic materials where two sets of stresses appear, use the lower values.

<sup>2</sup>Type F (Furnace welded, using open hearth, basic oxygen, or electric furnace only) limited to Class II applications with a maximum service temperature of 450 °F. Type E (ERW grade) limited to maximum service temperature of 650 °F, or less.

<sup>3</sup>Electric resistance welded pipe or tubing of this specification may be used to a maximum design pressure of 350 pounds per square inch gage.

<sup>4</sup>Refer to limitations on use of welded grades given in § 56.60–2(b).

<sup>5</sup>Use generally considered for Classes I–L and II–L applications. For Class I–L service only, the seamless grade is permitted. For other service refer to footnote 4 and to § 56.50–105.

<sup>6</sup>Furnace lap or furnace butt grades only. Limited to Class II applications only where the maximum service temperature is 450 °F, or less.

<sup>7</sup>Limited to Grades 285A, 285B, and 285C only (straight and spiral seam). Limited to Class II applications only where maximum service temperature is 300 °F or less for straight seam, and 200 °F or less for spiral seam.

<sup>8</sup>Limited to Class II applications where the maximum service temperature is 300 °F or less for straight seam and 200 °F or less for spiral seam.

<sup>9</sup>For Class I applications only the Class I Grade of the specification may be used.

<sup>10</sup>When used in piping systems, a certificate shall be furnished by the manufacturer certifying that the mechanical properties at room temperature specified in ASTM A 520 (incorporated by reference; see 46 CFR 56.01–2) have been met. Without this certification, use is limited to applications within heat exchangers.

<sup>11</sup>When used in piping systems, a certificate shall be furnished by the manufacturer certifying that the mechanical properties for A192 in ASTM A 520 have been met. Without this certification, use is limited to applications within heat exchangers.

<sup>12</sup>Hydrostatic testing of these fittings is not required but all fittings shall be capable of withstanding without failure, leakage, or impairment of serviceability, a hydrostatic test of 1½ times the designated rating pressure.

## Coast Guard, Dept. of Homeland Security

## § 56.60–1

<sup>13</sup> Other acceptable iron castings are in UCI–23 and UCD–23 of section VIII of the ASME Boiler and Pressure Vessel Code. (See also §§ 56.60–10 and 56.60–15.) Acceptable castings of materials other than cast iron may be found in sections I or VIII of the ASME Boiler and Pressure Vessel Code.

<sup>14</sup> Acceptable when complying with American National Standards Institute standards. Ductile iron is acceptable for temperatures not exceeding 650 °F. For pressure temperature limitations refer to UCD–3 of section VIII of the ASME Boiler and Pressure Vessel Code. Other grades of cast iron are acceptable for temperatures not exceeding 450 °F. For pressure temperature limitations refer to UCI–3 of section VIII of the ASME Boiler and Pressure Vessel Code.

<sup>15</sup> For limitations in use refer to §§ 56.10–5(c) and 56.60–20.

<sup>16</sup> Copper pipe must not be used for hot oil systems except for short flexible connections at burners. Copper pipe must be annealed before installation in Class I piping systems. See also §§ 56.10–5(c) and 56.60–20.

<sup>17</sup> The stress values shall be taken from UNF23 of section VIII of the ASME Boiler and Pressure Vessel Code for B75 annealed and light drawn temper as appropriate.

<sup>18</sup> B68 shall be acceptable if provided with a mill hydrostatic or eddy current test.

<sup>19</sup> Centrifugally cast pipe must be specifically approved by the Marine Safety Center.

<sup>20</sup> Limited to pipe fittings and valves. See 46 CFR 56.60–15(d) for additional information.

TABLE 56.60–1(b)—ADOPTED STANDARDS APPLICABLE TO PIPING SYSTEMS (REPLACES TABLE 126.1)

American National Standards Institute (all incorporated by reference; see 46 CFR 56.01–2)	
ANSI/ASME B1.1 .....	1982 Unified Inch Screw Threads (UN and UNR Thread Form).
ANSI/ASME B1.20.1 .....	1983 Pipe Threads, General Purpose (Inch).
ANSI/ASME B1.20.3 .....	1976 (Reaffirmed 1982) Dryseal Pipe Threads (Inch).
ANSI/ASME B16.15 .....	1985 [Reaffirmed 1994] Cast Bronze Threaded Fittings, Classes 125 and 250.
American Society of Mechanical Engineers (ASME) International (all incorporated by reference; see 46 CFR 56.01–2)	
ASME B16.1 .....	1998 Cast Iron Pipe Flanges and Flanged Fittings, Classes 25, 125, 250.
ASME B16.3 .....	1998 Malleable Iron Threaded Fittings, Classes 150 and 300.
ASME B16.4 .....	1998 Gray Iron Threaded Fittings, Classes 125 and 250.
ASME B16.5 .....	2003 Pipe Flanges and Flanged Fittings NPS ½ Through NPS 24 Metric/Inch Standard. <sup>3</sup>
ASME B16.9 .....	2003 Factory-Made Wrought Steel Butt welding Fittings.
ASME B16.10 .....	2000 Face-to-Face and End-to-End Dimensions of Valves.
ASME B16.11 .....	2001 Forged Fittings, Socket-Welding and Threaded.
ASME B16.14 .....	1991 Ferrous Pipe Plugs, Bushings, and Locknuts with Pipe Threads.
ASME B16.18 .....	2001 Cast Copper Alloy Solder Joint Pressure Fittings. <sup>4</sup>
ASME B16.20 .....	1998 (Revision of ASME B16.20 1993) Metallic Gaskets for Pipe Flanges: Ring-Joint, Spiral-Wound, and Jacketed.
ASME B16.21 .....	2005 Nonmetallic Flat Gaskets for Pipe Flanges.
ASME B16.22 .....	2001 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings. <sup>4</sup>
ASME B16.23 .....	2002 Cast Copper Alloy Solder Joint Drainage Fittings: DWV. <sup>4</sup>
ASME B16.24 .....	2001 Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500, and 2500. <sup>3</sup>
ASME B16.25 .....	2003 Butt welding Ends.
ASME B16.28 .....	1994 Wrought Steel Butt welding Short Radius Elbows and Returns. <sup>4</sup>
ASME B16.29 .....	2007 Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings-DWV. <sup>4</sup>
ASME B16.34 .....	1996 Valves—Flanged, Threaded, and Welding End. <sup>3</sup>
ASME B16.42 .....	1998 Ductile Iron Pipe Flanges and Flanged Fittings, Classes 150 and 300.
ASME B18.2.1 .....	1996 Square and Hex Bolts and Screws (Inch Series).
ASME/ANSI B18.2.2 .....	1987 Square and Hex Nuts (Inch Series).

**§ 56.60–1**

**46 CFR Ch. I (10–1–14 Edition)**

TABLE 56.60–1(b)—ADOPTED STANDARDS APPLICABLE TO PIPING SYSTEMS (REPLACES TABLE 126.1)—Continued

ASME B31.1 .....	2001 Power Piping ASME Code for Pressure Piping, B31.
ASME B36.10M .....	2004 Welded and Seamless Wrought Steel Pipe.
ASME B36.19M .....	2004 Stainless Steel Pipe.
American Society for Testing and Materials (ASTM) (all incorporated by reference; see 46 CFR 56.01–2)	
ASTM F 682 .....	Standard Specification for Wrought Carbon Steel Sleeve-Type Pipe Couplings.
ASTM F 1006 .....	Standard Specification for Entrainment Separators for Use in Marine Piping Applications. <sup>4</sup>
ASTM F 1007 .....	Standard Specification for Pipe-Line Expansion Joints of the Packed Slip Type for Marine Application.
ASTM F 1020 .....	Standard Specification for Line-Blind Valves for Marine Applications.
ASTM F 1120 .....	Standard Specification for Circular Metallic Bellows Type Expansion Joints for Piping Applications. <sup>4</sup>
ASTM F 1123 .....	Standard Specification for Non-Metallic Expansion Joints.
ASTM F 1139 .....	Standard Specification for Steam Traps and Drains.
ASTM F 1172 .....	Standard Specification for Fuel Oil Meters of the Volumetric Positive Displacement Type.
ASTM F 1173 .....	Standard Specification for Thermosetting Resin Fiberglass Pipe and Fittings to be Used for Marine Applications.
ASTM F 1199 .....	Standard Specification for Cast (All Temperature and Pressures) and Welded Pipe Line Strainers (150 psig and 150 Degrees F Maximum).
ASTM F 1200 .....	Standard Specification for Fabricated (Welded) Pipe Line Strainers (Above 150 psig and 150 Degrees F.)
ASTM F 1201 .....	Standard Specification for Fluid Conditioner Fittings in Piping Applications above 0 Degrees F.
Expansion Joint Manufacturers Association Inc. (incorporated by reference; see 46 CFR 56.01–2)	
Standards of the Expansion Joint Manufacturers Association, 1980	
Fluid Controls Institute Inc. (incorporated by reference; see 46 CFR 56.01–2)	
FCI 69–1 .....	Pressure Rating Standard for Steam Traps.
Manufacturers' Standardization Society of the Valve and Fittings Industry, Inc. (all incorporated by reference; see 46 CFR 56.01–2) <sup>4</sup>	
SP–6 .....	Standard Finishes for Contact Faces of Pipe Flanges and Connecting-End Flanges of Valves and Fittings.
SP–9 .....	Spot Facing for Bronze, Iron and Steel Flanges.
SP–25 .....	Standard Marking System for Valves, Fittings, Flanges and Unions.
SP–44 .....	Steel Pipe Line Flanges. <sup>4</sup>
SP–45 .....	Bypass and Drain Connection Standard.
SP–51 .....	Class 150LW Corrosion Resistant Cast Flanges and Flanged Fittings. <sup>4</sup>
SP–53 .....	Quality Standard for Steel Castings and Forgings for Valves, Flanges and Fittings and Other Piping Components—Magnetic Particle Examination Method.

TABLE 56.60-1(b)—ADOPTED STANDARDS APPLICABLE TO PIPING SYSTEMS (REPLACES TABLE 126.1)—Continued

SP-55 .....	Quality Standard for Steel Castings for Valves, Flanges and Fittings and Other Piping Components—Visual Method.
SP-58 .....	Pipe Hangers and Supports—Materials, Design and Manufacture.
SP-61 .....	Pressure Testing of Steel Valves.
SP-67 .....	Butterfly Valves. <sup>2 4</sup>
SP-69 .....	Pipe Hangers and Supports—Selection and Application.
SP-72 .....	Ball Valves with Flanged or Butt-Welding Ends for General Service. <sup>4</sup>
SP-73 .....	Brazing Joints for Copper and Copper Pressure Fittings.
SP-83 .....	Class 3000 Steel Pipe Unions, Socket-Welding and Threaded.

<sup>1</sup> [Reserved]<sup>2</sup> In addition, for bronze valves, adequacy of body shell thickness shall be satisfactory to the Marine Safety Center. Refer to § 56.60-10 of this part for cast-iron valves.<sup>3</sup> Mill or manufacturer's certification is not required, except where a needed portion of the required marking is deleted because of size or is absent because of age of existing stocks.<sup>4</sup> Because this standard offers the option of several materials, some of which are not generally acceptable to the Coast Guard, compliance with the standard does not necessarily indicate compliance with these rules. The marking on the component or the manufacturer or mill certificate must indicate the specification or grade of the materials as necessary to fully identify the materials. The materials must comply with the requirements in this subchapter governing the particular application.

[USCG-2003-16630, 73 FR 65179, Oct. 31, 2008]

**§ 56.60-2 Limitations on materials.**

*Welded pipe and tubing.* The following restrictions apply to the use of welded pipe and tubing specifications when utilized in piping systems, and not when utilized in heat exchanger, boiler, pressure vessel, or similar components:

(a) *Longitudinal joint.* Wherever possible, the longitudinal joint of a welded pipe shall not be pierced with holes for branch connections or other purposes.

(b) *Class II.* Use unlimited except as restricted by maximum temperature or pressure specified in Table 56.60-1(a) or by the requirements contained in § 56.10-5(b) of this chapter.

(c) *Class I.* (1) For those specifications in which a filler metal is used,

the following applies to the material as furnished prior to any fabrication:

(i) For use in service above 800 °F, full welding procedure qualifications by the Coast Guard are required. See part 57 of this subchapter.

(ii) Ultrasonic examination as required by item S-6 in ASTM A 376 (incorporated by reference; see 46 CFR 56.01-2) shall be certified as having been met in all applications except where 100 percent radiography is a requirement of the particular material specification.

(2) For those specifications in which no filler material is used in the welding process, the ultrasonic examination as required by item S-6 in ASTM A-376 shall be certified as having been met for service above 800 °F.

TABLE 56.60-2(a)—ADOPTED SPECIFICATIONS NOT LISTED IN THE ASME BOILER AND PRESSURE VESSEL CODE \*

ASTM specifications	Source of allowable stress	Notes
Ferrous Materials <sup>1</sup>		
Bar stock:		
A 276 ..... (Grades 304-A, 304L-A, 310-A, 316-A, 316L-A, 321-A, 347-A, and 348-A).	See footnote 4 .....	( <sup>4</sup> ).
A 575 and A 576. (Grades 1010-1030) .....	See footnote 2 .....	( <sup>2 3</sup> ).